NAFTA and the Changing Pattern of State Exports

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Abstract. The trade liberalization associated with NAFTA has affected the pattern of state exports by altering the origin as well as the destination of merchandise exports. We find that NAFTA has increased US merchandise exports to Mexico and Canada by just over 15 percent, and has increased total US merchandise exports by nearly 8 percent. We also find that although many states have seen large increases in exports to both Mexico and Canada, others have seen large decreases. NAFTA has also affected states' exports to non-NAFTA regions of the world, tending to decrease exports to Europe and Latin America and increase exports to Asia. States in the northeast regions of the United States have seen the smallest increases in exports in the wake of NAFTA.

JEL classification: F15, R12

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1 Introduction

Changes in trade policy have the potential to affect economic activity in regions of a country to varying degrees. The heated discussions preceding the passage of the North American Free Trade Agreement (NAFTA) in late 1993 demonstrated vividly that potential regional changes were a major concern of legislators. According to Baldwin and Magee (2000), the primary reason that some members in the US House of Representatives voted in favor of NAFTA was their expectation that the legislation's effects on trade and investment flows would increase jobs and wages in their districts. On the other hand, they also found that the primary reason that

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many other House members voted against NAFTA was their expectation that passage would result in fewer jobs and lower wages.[1]

Regardless of whether one's primary interest is in NAFTA's effects on local jobs, as a politician might be, or in its effects on welfare, as an economist would likely be, any analysis of state or regional effects of NAFTA must begin with its effects on trade volumes. To this end, our analysis makes an initial assessment of the differential effects of NAFTA on merchandise exports across US states.[2] We find, not surprisingly, that the relative price and other changes set in motion by NAFTA had different effects across states.[3] These different effects likely reflect the varying distributions of productive resources across regions and the substantial regional differences in what is produced and exported.[4]

We estimate a gravity model that allows assessments of not only the effects of NAFTA on each state's exports to Mexico and to Canada, but also on exports to Asia, Europe, and Latin America and the Caribbean. Few estimates of the state-level effects of NAFTA have appeared to date. To our knowledge, this is the first study that estimates state-level export performance with a gravity model, a model that has become the workhorse of the international trade literature. Ideally, we would have included state imports in our analysis, but the United States does not

[1] The employment consequences of NAFTA, even at the national level, were at the center of the controversy. Despite strong economic arguments that the employment effects for the US economy as a whole would be minimal, these arguments were rejected by many. In fact, as discussed by Kahane (1996), estimated employment effects ranged from large (i.e., hundreds of thousands) job losses to large job gains.

[2] To simplify our discussion, we refer to the District of Columbia as a state.

[3] NAFTA, which entered into force on January 1, 1994, will lead to a phasing out of Canadian, Mexican, and US tariffs on goods produced in North America. Tariffs on US-Canada trade were eliminated by 1998 as part of the 1988 US-Canada Free Trade Agreement. Tariffs on trade involving either the United States or Canada with Mexico are to be eliminated by 2008. Some of these tariffs were eliminated immediately, while others are being phased out over time. For details on these tariff changes as well as other aspects of NAFTA, see United States Trade Representative (1997).

[4] See Coughlin and Fabel (1988), Coughlin and Mandelbaum (1990), Kim (1995), and Gazel and Schwer (1998).

collect state-level import data.[5] Nevertheless, the partial picture provided by export data provides substantial evidence of the importance of geography on the effects of NAFTA.

Standard customs union theory predicts that integration regimes such as NAFTA lead to increases in trade between member countries (trade creation) and decreases in trade between members and non-members (trade diversion). Because the distinction between countries and regions within countries is artificial, these same predictions apply to the effects of integration on regional trade volume — NAFTA should lead a region in the United States to trade more with Canada and Mexico and less with the rest of the world. However, recent theoretical advances under the label "new economic geography" suggest that the neat trade-creation/trade-diversion dichotomy is insufficient when factor mobility is taken into account.[6] This mobility might be between regions within a member country, or across member-country borders — Ross Perot's "giant sucking sound."

One of the ways by which factor mobility makes NAFTA affect geographic trade patterns is by expanding the spatial distributions of firms' customers and suppliers. For example, consider a firm initially located in New Jersey. The addition of Mexico to the free trade area expands the spatial distributions of the firm's customers and suppliers southward, increasing the profitability of being closer to Mexico. If the firm relocates, goods that had been exported to NAFTA members from New Jersey would instead be exported from, perhaps, Arizona. The firm's relocation would also change the firm's position relative to non-NAFTA markets, making it cheaper to export to Asia and more expensive to export to Europe. State export patterns would adjust accordingly.

[5] Using Canadian provincial data, which covers imports and exports, Wall (2000) provides a partial view of the effects of NAFTA on state imports.

[6] See Gunderson (1998), Krugman (1998), and Fujita et al. (1999).

NAFTA might also affect geographic trade patterns by expanding the set of possible places for firms to locate. Under NAFTA, if that firm from New Jersey moves into Mexico, it can do so without losing tariff-free access to its domestic markets. Thus, instead of the firm exporting to Mexico, it exports from Mexico to New Jersey and other states. Extra-NAFTA trade would also be affected because the firm's exports would be from Mexico to the rest of the world, rather than from New Jersey.

When these geographic effects are taken into account, the standard, unambiguous expectations of trade creation and trade diversion no longer hold at the national or state levels. Instead, they create the possibility that NAFTA has led to decreases in state exports to Mexico and Canada, or to increases in state exports to non-NAFTA countries. Indeed, we find that, while the standard results predominated, there were sufficiently many counter-results to indicate that geographic effects have been important in determining the effects of NAFTA on state export patterns.

2 An overview of empirical research

Prior to discussing our analysis in detail, we briefly examine some background material to provide some context for understanding our contribution. We highlight, first, the different approaches used in previous subnational export studies and, second, the emerging literature that has attempted to estimate the effects of NAFTA.

2.1 Subnational export studies

Research on exports from US states has tended to rely on either regression or shift-share models.[7] One group of studies, exemplified by Coughlin and Fabel (1988) and Erickson and

[7] See Cronovich and Gazel (1998) and Gazel and Schwer (1998) for a discussion of subnational export research.

Hayward (1992), is based on Heckscher-Ohlin trade models. These supply-oriented studies, focused on the sources of US comparative advantage, indicate that differences in state endowments of human and physical capital contribute to differences in state export performance. A second group of regression studies, exemplified by Erickson and Hayward (1991) and Cronovich and Gazel (1998), focuses on the role of foreign demand in explaining subnational export behavior. These studies are somewhat similar to our study because they examine some of the same determinants of export performance that appear in gravity models. Erickson and Hayward (1991) found that the exports of a US region are related positively to the destination country's gross domestic product and negatively to the distance to the destination. Recently, Cronovich and Gazel (1998) found that trade-weighted exchange rates and foreign incomes were statistically significant determinants of state exports.[8]

The other common method of analyzing subnational exports, shift-share analysis, is primarily an accounting method. Research using this method includes Coughlin and Mandelbaum (1990), Hayward (1995), Gazel and Schwer (1998), and Coughlin and Pollard (2001). Coughlin and Mandelbaum (1990) found that the industrial composition of a state's exports was not a major influence on its export growth between 1976 and 1986. Meanwhile, the competitive effect, which the authors link to human capital, is the primary factor accounting for state export growth. Hayward (1995) examines the importance to US states of European trade and discusses the possible state-level effects of European integration. Gazel and Schwer (1998) extended the classic shift-share model to incorporate what they classify as a demand factor, the

[8] Another focus of subnational studies is the relationship between states' foreign involvement and growth. Representative studies include Coughlin and Cartwright (1987), Manrique (1987), Erickson (1989), and Carlino et al. (1994). Coughlin and Cartwright (1987) estimate short- and long-run export elasticities of employment and find much diversity across states. Manrique (1987) estimates growth models and finds that those states increasing their export orientation tended to grow faster during the 1970s than those states that did not. Erickson (1989) also finds that state export growth contributes to employment and value-added growth. Finally, Carlino et al. (1994) find that real exchange rate movements have only small effects on most states' growth.

destination of a state's exports. Their results suggest that this demand factor is as important as supply conditions in explaining state export performance between 1989 and 1992. Using Gazel and Schwer's model, however, Coughlin and Pollard (2001) do not find a similar result for state export growth between 1988 and 1998. They find that the competitive effect dominates both the industry mix and destination effects in accounting for a state's relative export performance.[9]

2.2 The effects of NAFTA

Research attempting to make some preliminary assessments of the effects of NAFTA has begun. Krueger (1999, 2000) focuses on whether this preferential trading arrangement has reduced welfare via trade diversion rather than enhancing it via trade creation. Using a number of approaches, one of which is a gravity model of aggregate trade flows, she finds that the evidence for trade creation appears to be stronger than that for trade diversion.

She stresses, however, that her conclusion is tentative. For various reasons, it is difficult to separate economic behavior into pre-NAFTA (i.e., prior to January 1, 1994) and post-NAFTA periods. First, firms and other important decisionmakers had formed expectations of NAFTA prior to its official passage. Presidents Bush and Salinas signed an agreement in June 1990 to negotiate such an agreement, so it is reasonable to think that some economic actions were taken in anticipation of passage. Second, the agreement called for a 10-to15-year phase-in of the tariff cuts for many commodities. Third, NAFTA can be viewed as another step in the process of Mexican trade liberalization. For example, Hinojosa-Ojeda et al. (2000) found that Mexico's unilateral trade liberalization, begun in the mid-1980s, stimulated a substantial increase in the

[9] Gazel and Schwer (1998) discuss two other shift-share studies — Markusen et al. (1991) and Hayward and Erickson (1995) — that are relevant to understanding the determinants and effects of subnational trade flows.

two-way trade of manufactured intermediate goods that has continued and matured during NAFTA's existence.

More recently, Romalis (2001) concludes that NAFTA has had a substantial positive effect on Canadian and Mexican shares of US imports, particularly in the industries with the largest relative tariff reductions. Romalis concludes, though, that because NAFTA led to no increase in overall imports, the increase in imports from Canada and Mexico were at the expense of imports from the rest of the world.

Several studies using various methodologies have estimated the effect of NAFTA on trade and investment flows and, in turn, how these flows have affected employment and earnings.[10] In addition, some work has been done to estimate the partial equilibrium effects of NAFTA at the industry level.[11] Generally speaking, these studies have paid scant attention to the differing regional effects of NAFTA.[12] Nevertheless, given the disparity in states' comparative advantages and proximity to trading partners, there is every reason to believe that the state-level effects of NAFTA would be far from uniform. Also, because NAFTA set in motion changes in the United States' trading relationship with not only Mexico and Canada, but also with the rest of the world, it is likely that the existing estimates capture only some of NAFTA's effects. Thus, a more general approach to capture a broader geographic range of effects might generate results that are more meaningful. Research by Wall (2000) exemplifies one such approach.

[10] See Hinojosa-Ojeda et al. (2000) for a review of many of these studies.

[11] See Karemera and Ojah (1998), US International Trade Commission (1997a), and Wylie (1995).

[12] Exceptions include Scott (1999) and Rothstein and Scott (1997), who try to discern state employment effects from changes in aggregate bilateral trade deficits — a dubious yet common approach (Hinojosa-Ojeda et al., 2000, p. 6). State employment effects were also estimated by Bolle (2000), whose estimates of job losses depend on certifications under the Department of Labor's NAFTA-Transitional Adjustment Assistance program. Hinojosa-Ojeda et al. (2000, p. 62) cite several ways in which the numbers from this program mis-state the number of actual jobs lost due to NAFTA.

Using data on Canadian provincial trade, Wall uses a gravity model to estimate the effects of NAFTA on the geographic pattern of North American trade. Specifically, he looks at the effects of NAFTA on trade flows between subnational regions within North America and between North American regions and the non-NAFTA world. Although most of the estimated effects are consistent with standard customs union theory — increased trade between members of NAFTA and decreased trade between members of NAFTA and non-members — many are not. For example, Wall found that NAFTA led to decreased trade between Eastern Canada and much of North America and to increased trade between Mexico and Asia.

Similar to Wall (2000), our analysis is of the effect of NAFTA on the geographic pattern of trade. However, our analysis is from the perspective of US states and estimates the effects of NAFTA on their exports to Mexico, Canada, and major regions of the world.

3 The empirical model

As with the majority of recent work on the effects of international integration on aggregate trade volumes, we use a gravity model to estimate the effects of NAFTA. Gravity models of international trade were pioneered by Tinbergen (1962), Pöyhönen (1963), and Linnemann (1966). In gravity models, the volume of trade is estimated as an increasing function of the national incomes of the trading partners and a decreasing function of the distance between them. In these simple models, the effects of integration are estimated by including dummy variables to indicate shifts in the gravity equation following integration. Because of its simplicity and empirical success, the model has subsequently become a workhorse of the empirical trade literature. Further, because it is a general equilibrium model, it does not suffer from the well-known defects of partial equilibrium studies.

The major practical advantage of the gravity model is that it does not require one to specify the complicated processes underlying trade flows. On the other hand, despite its empirical usefulness, the fact that it is largely *ad hoc* means that it has been treated with some suspicion by international trade theorists. Nonetheless, Deardorff (1984, p. 504) concluded that gravity models "tell us something very important about what happens in international trade, even if they do not tell us why." More recently, papers by Bergstrand (1985, 1989) and Deardorff (1998), among others, demonstrate that the gravity model can be derived within a variety of standard theoretical frameworks. In fact, according to Frankel (1998, p. 2), the gravity model has "gone from an embarrassing poverty of theoretical foundations to an embarrassment of riches."

Our study relies on state-level merchandise export data for all 50 states and the District of Columbia to most countries in the world. The data are prepared by the Massachusetts Institute for Social and Economic Research (MISER) at the University of Massachusetts-Amherst. The MISER data are export shipments by state of origin of movement to various destinations throughout the world. Although this data set is regarded as the best available source for state export data, it has well-known weaknesses — the most important of which arise from the differences between the origin of movement and the origin of production — which have been discussed in Cronovich and Gazel (1999), Hayward and Erickson (1995), and Coughlin and Mandelbaum (1991).

While the potential problems with the MISER data are well documented, it is very difficult to measure the extent to which they matter. In examining the MISER series, Cronovich and Gazel (1999) compare with to the Census Bureau's AR series (Exports from Manufacturing Establishments) — which they regard as the series that best indicates the origin of production — that was published only for the period 1987 to 1992. They conclude that for most states, the

MISER series is "an acceptably close substitute for the AR series" for the period. The eight (mostly small) states that do not satisfy their criteria are the District of Columbia, Montana, Nevada, New Hampshire, New Mexico, Tennessee, and Vermont.

We include 32 destination countries in our data set: Canada, Mexico, and the top ten US export destinations in each of Europe, Asia, and Latin America and the Caribbean (excluding Mexico).[13] We complete our data set with gross domestic product (GDP) data from the World Bank, gross state product (GSP) data from the Bureau of Economic Analysis, and the consumer price index from the Bureau of Labor Statistics. We have complete data for the years 1988 to 1997, providing us with 16,320 observations.

Such a large data set provides substantial freedom to disaggregate the effects of NAFTA. To exploit this opportunity, we created 255 separate dummy variables to capture NAFTA's effects on every state's exports to each of Canada, Mexico, and three non-North American continents.[14] Our gravity model is standard, except that, following Mátyás (1997), Bayoumi and Eichengreen (1997), Baier and Bergstrand (2001), and Cheng and Wall (2001), we allow the intercept to differ across trading partners. The following heterogeneous gravity equation, modified as noted below, is estimated by least squares:

$$\begin{aligned}\ln(1+x_{ijt}) = {} & \alpha_0 + \alpha_{ij} + \beta \ln Y_{it} + \gamma \ln Y_{jt} + \delta \ln D_{ij} \\ & + \sum_{s=1}^{51} \left(\sum_{c=1}^{5} \theta^{sc} NAFTA_{ijt}^{sc} + \eta^{s} EU_{ijt}^{s} + \mu^{s} MERC_{ijt}^{s} \right) + \lambda t + \varepsilon_{ijt}; \end{aligned} \tag{1}$$

where x_{ijt} is real exports from state i to country j in year t, α_0 is the portion of the intercept common to all state-country pairs, α_{ij} is the pair-specific portion of the intercept, Y_{it} is the real

[13] These countries are: *Europe:* the United Kingdom, Germany, the Netherlands, France, Belgium, Italy, Switzerland, Spain, Ireland, and Sweden; *Asia:* Japan, South Korea, Singapore, Hong Kong, China, Malaysia, Thailand, Philippines, Indonesia, and Vietnam; *Latin America and the Caribbean:* Brazil, Venezuela, Colombia, Argentina, Chile, Dominican Republic, Costa Rica, Peru, Guatemala, and Jamaica. Taiwan is not included because the World Bank does not provide GDP data for it.

[14] For simplicity, we refer to Latin America and the Caribbean as a continent.

GSP of state i in year t, Y_{jt} is the real GDP of country j in year t, and D_{ij} is the distance between state i and country j. Note that because some observations of state exports are zero, our dependent variable is the log of 1 plus exports. Censoring of this sort normally requires Tobit estimation, but doing so would mean losing the double-log relationship inherent to the gravity model. Our approach preserves the double-log form while approximating Tobit results (Eichengreen and Irwin, 1998).

Exports from state i to country j also depend on other factors — contiguity, common language, and historical or cultural links — that are usually included in gravity models. In (1), their effect on trade volume is $\alpha_{ij} = \boldsymbol{\omega}\mathbf{Z}'_{\mathbf{ij}}$, where $\mathbf{Z_{ij}}$ is a vector of fixed factors that make the volume of exports from i to j differ from the average. This is the only difference between our heterogeneous gravity model and the traditional homogeneous one, which imposes the restriction that $\alpha_{ij} = 0$ for all pairs of i and j. Notice that α_{ij} and $\delta \ln D_{ij}$ cannot be separated in the estimation because they are perfectly collinear. Thus, we estimate their sum as a fixed effect, $\pi_{ij} = \alpha_{ij} + \delta \ln D_{ij}$. The fixed effects are estimated using a dummy variable for each of our 1,683 state-country pairs.[15] A state-country dummy takes the value of 1 whenever the observation is of exports from the state to the country, and is 0 otherwise.

Using fixed effects estimation allows us to capture the influence of not only distance and other fixed variables normally specified in gravity models, but also of any number of important factors that may be difficult or impossible to quantify and which are, therefore, normally excluded. As shown by Mátyás (1997), Bayoumi and Eichengreen (1997), and Cheng and Wall (2001), excluding these variables, which is the same as restricting their effects to be the same

[15] Note that we count pre- and post-unification Germany as two different countries, making our panel data set unbalanced, without 1988-90 observations for unified Germany or 1991-97 observations for West Germany.

across states and countries, results in serious estimation bias.[16] Also, because we do not have to measure distance — it is subsumed into the fixed effect — we avoid having to choose one of the *ad hoc* measures of distance normally used, while still controlling for the effects of distance on trade volume.

Another potential benefit of fixed effects estimation is that it may allow us to control for estimation bias resulting from the potentially large divergence between the MISER data and exports based on the origin of movement. This is because the fixed effect term would pick up any proportional divergence between the two series that is consistent over the sample. In this case, the divergence would be just like any other unobserved pair-specific heterogeneity, as it would be controlled for with the pair-specific fixed effects.

We estimate the effects of NAFTA and overseas integration on the exports of the 51 states. The percentage effects of NAFTA are approximated by the coefficients on a state's five state-to-continent dummy variables: $NAFTA_{ijt}^{sc}$ is equal to 1 when the observation is of exports from state *s* to a country in continent *c* in a year after and including 1994, and is 0 otherwise.

NAFTA was not the only regional integration agreement that happened during our sample period that could have affected North American trading patterns. The European Community (EC) reduced most internal barriers in 1993 when it became the European Union (EU); and Argentina, Brazil, Uruguay, and Paraguay formed the Southern Cone Common Market (Mercosur) in 1995. To control for the effects of these overseas regime changes on US state exports to EU and Mercosur members, we include state-specific dummy variables for both. The dummy EU_{ijt}^{s} takes the value of 1 when the observation is of state *s* exporting to an EU

[16] Rather than using dummy variables, we could control for fixed effects by using the first differences of the variables. However, this approach is not appropriate in the present case because it would place arbitrary restrictions on our estimates of the trend effect (Cheng and Wall 2001).

member and the year is 1993 or later, when the EU's single market program was put into place.[17] The dummy $MERC_{ijt}^{s}$ is equal to 1 beginning in 1995 when the observation is of state *s* exporting to Argentina or Brazil, the two Mercosur countries in our sample. The parameters associated with the EU and Mercosur dummies approximate the estimated percentage effects of the regimes on a state's exports.

Although not controlled for with a separate variable, our estimation also accounts for the effects of exchange rate changes, such as those following the Mexican peso crisis of 1995, by using market exchange rates to convert variables into dollars. In the spirit of gravity models, this means that the economic size of a country, as measured by GDP, changes along with the value of its currency.[18,19]

We also include a trend variable, *t*, that is common to all trading pairs and captures the changes in trade volume that would have occurred even if there were no new regional trading regimes and no changes in income levels. In this sense, the coefficient on the time trend indicates the percentage change in trade due to "globalization," here defined as an inherent common trend toward increased international trade. Finally, ε_{ijt} is the random error term.

4 Empirical results

Tables 1a-c contain the results of our least squares estimation. As expected in gravity models, the coefficients on the incomes of states and countries are positive and statistically significant. The coefficient on the trend variable is positive and statistically significant and indicates that

[17] Note also that EU_{ijt} is equals to 1 for Sweden beginning in 1994, when, as a member of the European Free Trade Area, it began enjoying equal access to EU markets.

[18] Note that it has become common in recent versions of the gravity model to use exchange rates measured according to purchasing power parity rather than market value. However, for trading purposes, the relevant measure of a country's economy is not its worth for domestic purchases, but its worth for international purchases.

[19] See Cronovich and Gazel (1998) for an alternative treatment of exchange rates in a model of state exports.

globalization was responsible for an increase in state exports of 3.2 percent per year. Also, as Figure 1 illustrates, the residuals are reasonably well behaved, especially when compared with those generated by homogeneous gravity models. As demonstrated by Cheng and Wall (2001), plots of residuals generated by homogeneous gravity models indicate a strong tendency to underestimate high levels of trade and to overestimate low levels of trade.

Other than the effects of NAFTA, our most interesting results are our estimates of the effects of the EU and Mercosur on state exports. These are provided by Table 1b and are illustrated by Figures 2 and 3. Standard theory suggests that these customs unions would lead their members to divert their imports from non-member producers, such as the United States, toward other member countries. Thus, one would expect negative signs for our EU and Mercosur coefficients. However, we find that, while the change from the EC to the EU reduced total US exports to EU members by just over 24 percent, the formation of Mercosur *increased* total US exports to Mercosur members by nearly 29 percent.[20] The most likely explanation for this rather anomalous result is that the formation of Mercosur coincided with fairly dramatic liberalization of the economies of the member countries, including the relaxation of trade restrictions.

The effects of the EU and Mercosur were not uniform across states. There were three states — Idaho, Maryland, and Wyoming — for which the EU led to large increases (10% or greater) in exports to EU members; there were 14 other states for which the effect of the EU was small (less than 10% in either direction). Thus, for 34 states, the effect of the EU was a large decline in exports to EU members. All but one of the 27 statistically significant EU effects were negative.

[20] Throughout, the aggregate effects are calculated using 1997 exports to weight the state-level effects.

As for the effects of Mercosur, there were 13 states (concentrated in the Northeast and Northwest) that saw large decreases in exports to Mercosur members in the wake of that agreement. The effect of Mercosur was small for only six states and was large and positive for 32 states. Moreover, of the 31 statistically significant Mercosur effects, 29 were positive.

Our estimates of the 255 state-level NAFTA dummies, which approximate the percentage change in exports, are presented in Table 1c — 153 (102) possess positive (negative) signs, with 48 percent being statistically significant. These estimates are illustrated by maps in Figures 4 through 9. Table 1c also provides the estimated effects of NAFTA aggregated for each state across continents and for each continent across states. Table 2 presents the results aggregated to the regional level. Our results indicate that the effects of NAFTA were often contrary to the neat predictions of standard customs union theory. For example, while we find that at the aggregate level NAFTA led to increases of over 15 percent in US exports to Mexico and Canada, its effects on exports to non-NAFTA regions of the world were more complex.[21] Exports to Europe fell by almost 6 percent, exports to Asia rose by 15 percent, and there was a small negative effect of roughly 3 percent on exports to Latin America and the Caribbean.

As discussed in more detail below, the effects of NAFTA differed a great deal at the state and regional levels. For most states, the effects of NAFTA mirrored the increase in total US exports to Mexico and Canada, although to widely varying degrees. Perhaps more interesting, though, is our finding that many states have seen NAFTA lead to decreased exports to Mexico and Canada. Similarly, for extra-NAFTA exports the aggregate effects of NAFTA mask a rich variety of state and regional effects that were often counter to standard theoretical predictions.

[21] Despite the difficulty of making a straightforward comparison, our estimate of the overall effect of NAFTA on exports to Mexico is similar to one generated by Gould (1998). Our point estimate of NAFTA's effect on US exports to Canada exceeds Gould's; however, Gould characterizes his estimate as very imprecise.

NAFTA's effects on state exports to Mexico were not highly correlated with its effects on state exports to Canada. The simple correlation of 0.04 suggests that state exports to the two countries did not tend to be affected similarly by NAFTA. For extra-NAFTA exports, the various effects were similarly unrelated. Simple correlations between NAFTA's effects on state exports to Latin America and the Caribbean and on state exports to Europe as well as Asia are only 0.16 and 0.05, respectively. Also, the simple correlation of -0.04 between the effects of NAFTA on Asia and Europe suggests that these effects were also unrelated.

The only relationships between different NAFTA effects that we detect are for the effects on exports to both Canada and Mexico with the effect on exports to Latin America. The correlation coefficient between the effects for Mexico and Latin America is 0.34, which is statistically significant at the 1 percent level. Similarly, the correlation coefficient between the effects for Canada and Latin America is 0.22, which is significant at the 12 percent level. Thus, if NAFTA had a positive effect on a state's exports to Canada or Mexico, it also tended to have a positive effect on the state's exports to Latin America and the Caribbean.

4.1 Intra-NAFTA state and regional exports

Our estimates of the state-level effects of NAFTA on US exports to Mexico and Canada are listed in Table 1c and are illustrated by Figures 4 and 5. While we find that 28 states had their exports to Mexico increase by more than 10 percent because of NAFTA, we also find that eight states had decreases of greater than 10 percent. About two-thirds of these estimated changes, both positive and negative, were statistically significant. At the regional level (see Table 2), six of the nine regions of the United States experienced positive NAFTA effects of between 11 and 22 percent on exports to Mexico. The Southeast stood out, though, with a NAFTA effect of 32 percent driven by large effects for Virginia and the Carolinas. For the Plains the effect of

NAFTA on exports to Mexico was a rather modest 6.5 percent, while the Mideast, primarily reflecting a large negative effect on exports from New York, was the only region for which NAFTA led to a decrease in exports to Mexico.

Positive state-level effects of NAFTA on exports to Canada were widespread: 36 states had positive NAFTA effects of 10 percent or higher, and the effects tended to be statistically significant. Nevertheless, there were four states whose exports to Canada fell by more than 10 percent in the wake of NAFTA. At the regional level, though, NAFTA increased the exports to Canada for all nine regions, although the increases for the Great Lakes and Rocky Mountain regions were rather modest. For the Great Lakes, the regional number was dragged down by the large negative effect for Michigan, the only state in the region for which NAFTA did not lead to a large increase in exports to Canada.

Although our finding that NAFTA increased total US exports to Canada by 15 percent is very similar to the 13 percent increase found by Wall (2000), our estimates of the regional effects of NAFTA differ a great deal from his estimates. In particular, he finds a large increase (21 percent) in exports from the Great Lakes region to Canada, whereas we find a much more modest increase. Also, he finds small increases in exports from the Plains and Southwest to Canada (6 percent for each), whereas we find increases of 23 and 30 percent, respectively. His region-level results are not directly comparable to ours, however, as Canadian provincial trade data uses the Census Bureau's "origin of movement" method to assign states of origin, without adjustments of the sort performed by MISER.

4.2 Extra-NAFTA state and regional exports

Our estimates of the effects of NAFTA on US state exports to Europe, Asia, and Latin America and the Caribbean are listed in their respective columns of Table 1c and are illustrated by Figures

6, 7, and 8. The estimates aggregated to the regional level are listed in Table 2. We found that the 6 percent NAFTA-induced decrease in total US exports to Europe was regionally concentrated, and only 14 of the state-level effects were statistically significant. The Far West and the Mideast both saw NAFTA lead to large decreases in exports to Europe. For the Far West this was dominated by Washington's NAFTA effect of -25 percent, while it was New York's NAFTA effect of -19 percent that drove down the number for the Mideast. In contrast, the Rocky Mountain region saw a somewhat large increase in exports to Europe, driven by a NAFTA effect of 32 percent for Utah.

Similar to the effects of NAFTA on exports to Europe, its effect on US exports to Asia was far from uniform across states and regions. In contrast to the effects on exports to Europe, the effects of NAFTA on state exports to Asia were spread across the regions, and the state-level effects are statistically significant for 30 states. There were 22 states with NAFTA effects greater than 10 percent, and eight with negative NAFTA effects of 10 percent or more. However, this left 21 states with small NAFTA effects, split nearly evenly between positives and negatives. NAFTA led to increases in exports to Asia for most regions, although the increase for the Southeast was fairly small. NAFTA had a very small effect on exports from the Mideast to Europe, although the large positive effect for Maryland was cancelled out by the negatives for other states in the region. Similarly, New England's small negative effect would have been even more negative if Vermont had not had its 46 percent boost from NAFTA.

As with the effects of NAFTA on exports to Europe and Asia, there were interesting state and regional differences in the effects on exports to Latin America and the Caribbean. Despite a small aggregate effect, we found 21 states for which NAFTA led to large decreases in exports to Latin America, compared with only eight for which it led to large increases. For 25 states the effect was statistically significant. The regional characteristics of the effect of NAFTA on US

exports to Latin America and the Caribbean is clear from Figure 8. Large negative effects were concentrated in the states in the far North of the United States — there were decreases of 16 percent for exports from the Mideast and New England. In contrast, the large state-level increases in exports to Latin America following NAFTA were concentrated in the two southern regions.

4.3 Total state and regional exports

As discussed above, NAFTA has had many different effects on exports from the states and regions of the United States. It has not only affected the flow of trade from the United States to its NAFTA partners, but also to non-NAFTA parts of the world. An evaluation of the state, regional, and national effects of NAFTA on trade volumes would be incomplete without adding its effects on extra-NAFTA exports. The last column of Table 1c provides the aggregated estimates of the effects of NAFTA on total state exports, which are illustrated by Figure 9 and are aggregated to the regional level in the last column of Table 5.

The nearly 8 percent estimated boost in US exports from NAFTA was spread across the states and regions. Of the 12 states with estimated negative effects, only three had decreases of greater than 10 percent. These are Mississippi (-14 percent), the District of Columbia (-15 percent), and Delaware (-13 percent). Of the 39 states whose total exports increased, 27 saw increases in excess of 10 percent. The states with the largest positive effects were New Mexico (37 percent), Kentucky (35 percent), Colorado (29 percent), Indiana (26 percent), and 8 others who had their exports expand by more than 20 percent.

States either on the Canadian border or on the northern section of the Eastern Seaboard tended to have experienced small NAFTA effects. At the regional level, although the total effects of NAFTA on total exports were all positive, the increases for New England and the

Mideast were very small, with the latter being indistinguishable from zero. The estimated effects of NAFTA on the total exports for the other seven regions were all between 9 and 16 percent.

4.4 NAFTA and state growth

A review of the dynamic effects of trade liberalization by the US International Trade Commission (1997b) indicates much theoretical support for expecting trade liberalization to have a positive effect on economic growth. In the context of NAFTA, the literature suggests that those states with more positive export effects should have experienced relatively more rapid growth. To explore this hypothesis, as well as to generate some information concerning how reasonable our results are, we calculated simple correlations between state income growth between 1993 and 1998 and our estimates of the effects of NAFTA on total exports. The simple correlation of 0.38, which is statistically significant at the better than the 1 percent level, suggests that states with more pronounced NAFTA-related export effects also tended to grow faster.

In addition, we explored the connection between state income growth and our estimates of the effects of NAFTA on exports to specific regions. The simple correlation was virtually zero using the estimated export effects for both Mexico (-0.06) and Canada (0.05). A similar result was found for exports to Latin America and the Caribbean (0.12). Meanwhile, state income growth was correlated at better than the 10 percent significance level only with the estimated NAFTA effects on state exports to Europe (0.37) and Asia (0.25). Clearly, though, these results are only suggestive of the possible role that NAFTA may have played in determining state growth, and they are far from conclusive. Our simple correlations do not account for the simultaneity of exports and income, nor do they control for potential covariates that might explain changes in exports and changes in income.

Recent theoretical work suggests the possibility that international integration can affect the regional concentration of economic activities. In Krugman and Livas (1996), giant metropolises in the third world are the unintended consequence of import protection, so trade liberalization will lead to a dispersal of some activity out of metropolises.[22] In contrast, in Paluzie (2001), because of agglomeration effects, trade liberalization by a country with interregional labor mobility leads to a greater concentration of economic activity. Our results do not offer any evidence that NAFTA's effects were related to the initial pattern of economic activity. Specifically, the rank correlation between 1993 state per capita income and our estimates of the effects of NAFTA on state exports is -0.18, indicating a tendency for poorer states to have seen larger NAFTA effects. With a t-statistic of -1.29, though, this relationship is not statistically different from zero.

5 Conclusions

Our gravity model estimation generates numerous results concerning the effects of NAFTA on exports at the state level; however, our analysis also produces other noteworthy results. As expected in gravity models, we find that economic size matters — the incomes of states and destination countries are positive and statistically significant determinants of state exports. This is consistent with Erickson and Hayward (1991) and Cronovich and Gazel (1998), who find that state export flows are positively related to the GDPs of destination countries. We also find that globalization was responsible for a 3.2 percent increase in yearly state exports and that, according to our fixed effects estimates, many other factors — including distance and any number of unobservable pair-specific factors — matter as well.

[22] Wei and Wu (2001) find that urban-rural inequality was lower for Chinese cities that were more open to trade.

Existing estimates of the effect of NAFTA on aggregate US trade are rather lukewarm. Krueger (1999, 2000) finds no statistically significant effects, but concludes that the increase in trade with Mexico and Canada probably was larger than the decrease in trade with the rest of the world. Looking only at US imports, Romalis (2001) finds that the increase in imports from Mexico and Canada due to NAFTA has been at the expense of imports from the rest of the world, for a net decrease in US imports.

In contrast, we find that NAFTA had large and significant effects on US merchandise exports. We find that US exports to Mexico and Canada increased by 16 and 15 percent, respectively, while exports to Europe and Latin America decreased by 6 and 3 percent, respectively. In contrast with the standard trade creation/diversion dichotomy, we also find that NAFTA led to a 15 percent increase in exports to Asia. Overall, our results indicate that NAFTA has led to an 8 percent increase in yearly US exports.

NAFTA has also had wide-ranging state-level effects on merchandise exports. Most states saw increased total exports: 13 saw increases of 20 percent or more while another 12 saw increases between 12 and 20 percent. The effect of NAFTA on total exports was negative for 12 states, with three states seeing decreases of 10 percent or more.

This study has also generated results concerning NAFTA's effects on the relative importance of NAFTA members as recipients of state exports. As with the United States as a whole, most states saw large increases in exports to both Mexico and Canada, although there were significant differences across states. In particular, we find that, as a result of NAFTA, eight states saw large decreases in their exports to Mexico, while four states saw large decreases in their exports to Canada. As suggested by the new economic geography literature, these state-level decreases in intra-NAFTA exports highlight the importance of firm mobility in determining the effects of international integration on the pattern of state exports.

It is not only state exports to Canada and Mexico that have been affected by NAFTA, but also state exports to the non-NAFTA world. These effects varied greatly across states and destinations, and there was no consistent pattern of positive or negative effects. Also noteworthy is our finding that states' NAFTA effects have not tended to be very similar across the various export destinations.

The wide variety of state-level NAFTA effects suggests that, consistent with Coughlin and Fabel (1988) and Erickson and Hayward (1992), the distribution of states' productive resources plays a role in determining the geographic distribution of the effects of NAFTA. In addition, the fact that we found so many positive NAFTA effects (contrary to the usual negative trade diversion effects) indicates that the geographic mobility of firms has also likely been an important factor in determining the post-NAFTA pattern of exports. At this stage of our research, though, we are unable to separate the state-level NAFTA effects into their constituent parts.

In light of these results, estimation approaches such as the gravity model, that simultaneously account for the many different effects of integration, are essential to understanding how NAFTA has altered the pattern of state exports. Moreover, the great diversity of results across states and regions indicates the importance of geographic and subnational considerations in the evaluation of international integration.

References

Baldwin RE, Magee CS (2000) *Congressional trade votes: From NAFTA approval to fast-track defeat.* Institute for International Economics, Washington, DC

Bayoumi T, Eichengreen B (1997) Is regionalism simply a diversion? Evidence from the evolution of the EC and EFTA. In: Ito T, Krueger AO (eds) *Regionalism versus multilateral trade arrangements*. University of Chicago Press, Chicago

Baier SL, Bergstrand JH (2001) The growth of world trade: Tariffs, transport costs, and income similarity. *Journal of International Economics* 53:1-27

Bergstrand JH (1985) The gravity equation in international trade: Some microeconomic foundations and empirical evidence. *Review of Economics and Statistics* 67:474-481

Bergstrand JH (1989) The generalized gravity equation, monopolistic competition, and the factor-proportions theory of international trade. *Review of Economics and Statistics* 71:143-153

Bolle MJ (2000) *NAFTA: Estimated US job "gains" and "losses" by state over 5 1/2 years.* Congressional Research Service Report for Congress, February 2

Carlino GA, Voith R, Cody B (1994) The effects of exchange rate and relative productivity changes on US industrial output at the state level. *Urban Studies* 31:219-232

Cheng I-H, Wall HJ (2001) Controlling for heterogeneity in gravity models of trade. Federal Reserve Bank of St. Louis Working Paper 99-010B

Coughlin CC, Cartwright PA (1987) An examination of state foreign exports and manufacturing employment. *Economic Development Quarterly* 1:257-267

Coughlin CC, Fabel O (1988) State factor endowments and exports: An alternative to cross-industry studies. *Review of Economics and Statistics* 70:696-701

Coughlin CC, Mandelbaum TB (1990) Accounting for changes in manufactured exports at the state level: 1976-86. Federal Reserve Bank of St. Louis *Review* 72:3-14

Coughlin CC, Mandelbaum TB (1991) Measuring state exports: Is there a better way? Federal Reserve Bank of St. Louis *Review* 73:65-79

Coughlin CC, Pollard PS (2001) Comparing manufacturing export growth across states: What accounts for the differences? Federal Reserve Bank of St. Louis *Review* 83:25-40

Cronovich R, Gazel RC (1998) Do exchange rates and foreign incomes matter for exports at the state level? *Journal of Regional Science* 38:639-658

Cronovich R, Gazel RC (1999) How reliable are the MISER foreign trade data? unpublished manuscript

Deardorff AV (1984) Testing trade theories and predicting trade flows. In: Jones RW, Kenen PB (eds) *Handbook of international economics, volume 1.* North-Holland, New York

Deardorff AV (1998) Determinants of bilateral trade: Does gravity work in a neoclassical world? In: Frankel JA (ed) *The regionalization of the world economy.* University of Chicago Press, Chicago

Eichengreen B, Irwin DA (1998) The role of history in bilateral trade flows. In: Frankel JA (ed) *The regionalization of the world economy*. University of Chicago Press, Chicago

Erickson RA (1989) Export performance and state industrial growth. *Economic Geography* 65:280-292

Erickson RA, Hayward DJ (1991) The international flows of industrial exports from US regions. *Annals of the Association of American Geographers* 81:371-390

Erickson RA, Hayward DJ (1992) Interstate differences in relative export performance: A test of factor endowments theory. *Geographical Analysis* 24:223-239

Frankel JA (1998) Introduction. In: Frankel JA (ed) *The regionalization of the world economy.* University of Chicago Press, Chicago

Fujita M, Krugman P, Venables AJ (1999) *The spatial economy: Cities, regions, and international trade*. MIT Press, Cambridge

Gazel R, Schwer K (1998) Growth of international exports among the states: Can a modified shift-share analysis explain it? *International Regional Science Review* 21:185-204

Gould D (1998) Has NAFTA changed North American trade? Federal Reserve Bank of Dallas *Economic Review* First Quarter:12-23

Gunderson M (1998) Regional impacts of trade and investment on labour. *Canadian Journal of Regional Science* 21:197-225

Hayward DJ (1995) *International trade and regional economies: The impacts of European integration on the United States.* Westview Press, Boulder

Hayward DJ, Erickson RA (1995) The North American trade of US states: A comparative analysis of industrial shipments, 1983-1991. *International Regional Science Review* 18:1-31

Hinojosa-Ojeda R, Runsten D, De Paolis F, Kamel N (2000) *The US employment impacts of North American integration after NAFTA: A partial equilibrium approach*, manuscript produced at the North American Integration and Development Center, UCLA

Kahane LH (1996) Congressional voting patterns on NAFTA: An empirical analysis. *American Journal of Economics and Sociology* 55:395-409

Karemera D, Ojah K (1998) An industrial analysis of trade creation and diversion effects of NAFTA. *Journal of Economic Integration* 13:400-425

Kim S (1995) Expansion of markets and the geographic distribution of economic activities: The trends in US regional manufacturing structure, 1860-1987. *Quarterly Journal of Economics* 110:881-908

Krueger AO (1999) Trade creation and trade diversion under NAFTA. National Bureau of Research Working Paper 7429

Krueger AO (2000) NAFTA's effects: A preliminary assessment. *The World Economy* 23:761-775

Krugman P (1998) What's new about the new economic geography? *Oxford Review of Economic Policy* 14:7-17

Krugman P, Livas Elizondo R (1996) Trade policy and the Third World metropolis. *Journal of Development Economics* 49:137-150

Linnemann H (1966) *An econometric study of international trade flows.* North-Holland, Amsterdam

Manrique GG (1987) Foreign export orientation and regional growth in the United States. *Growth and Change* 18:1-12

Markusen AR, Nopenen H, Driessen K (1991) International trade, productivity, and US regional job growth: A shift-share interpretation. *International Regional Science Review* 14:15-39

Mátyás L (1997) Proper econometric specification of the gravity model. *The World Economy* 20:363-368

Paluzie E (2001) Trade policy and regional inequalities. *Papers in Regional Science* 80:67-85

Pöyhönen P (1963) A tentative model for the volume of trade between countries. *Weltwirtschaftliches Archiv* 90:93-100

Romalis J (2001) NAFTA's impact on North American trade. Graduate School of Business, University of Chicago, Working Paper

Rothstein J, Scott RE (1997) *NAFTA and the states: Job destruction is widespread.* Economic Policy Institute, Washington, DC

Scott RE (1999) *NAFTA's pain deepens: Job destruction accelerates in 1999 with losses in every state.* Economic Policy Institute, Washington, DC

Tinbergen J (1962) *Shaping the world economy - Suggestions for an international economic policy.* The Twentieth Century Fund, New York

US International Trade Commission (1997a) The impact of the North American Free Trade Agreement on the US economy and industries: A three year review. Investigation No. 332-381

US International Trade Commission (1997b) The dynamic effects of trade liberalization: An empirical analysis. Investigation No. 332-375

US Trade Representative (1997) *Study on the operation and effect of the North American Free Trade Agreement*, report to Congress per section 512 of the NAFTA Implementation Act

Wall HJ (2000) NAFTA and the geography of North American trade. Federal Reserve Bank of St. Louis Working Paper 2000-017B

Wei S-J, Wu Y (2001) Globalization and inequality: Evidence from within China. National Bureau of Research Working Paper 8611

Wylie PJ (1995) Partial equilibrium estimates of manufacturing trade creation and diversion due to NAFTA. *North American Journal of Economics and Finance* 6:65-84

Table 1a. Regression results: dependent variable = log of state-to-country exports

	Coefficient	*t*-statistic
Shared intercept[a]	-9.478*	-7.958
Log of gross state product	0.661*	5.593
Log of gross domestic product	0.475*	20.385
Trend	0.032*	10.396
EU and Mercosur dummies	see Table 1b	
NAFTA dummies	see Table 1c	
$\overline{R}^2$	0.964	
F(360,14277)	31.60	
Number of observations	16,320	

* indicates statistical significance at the 10% level using White-corrected standard errors.
[a] Estimates of the 1,683 state-country fixed effects are suppressed for space considerations.

Table 1b. Estimated effects of overseas integration on state exports

State	European Union Coeff.	*t*-stat.	Mercosur Coeff.	*t*-stat.
Alabama	-0.217 *	-3.051	0.226	1.501
Alaska	-0.497 *	-3.732	0.370 *	1.728
Arizona	-0.025	-0.201	0.227	1.099
Arkansas	0.054	0.458	0.656 *	3.789
California	-0.143 *	-2.535	0.219 *	1.770
Colorado	-0.102	-1.261	0.424 *	2.616
Connecticut	-0.160 *	-1.658	0.112	0.759
Delaware	-0.082	-0.433	0.290 *	1.663
Dist. of Columbia	-0.155	-0.601	-0.328 *	-1.732
Florida	-0.277 *	-5.354	0.556 *	3.656
Georgia	-0.186 *	-1.970	0.760 *	3.817
Hawaii	-0.386 *	-4.195	0.316	1.465
Idaho	0.224 *	1.870	0.365 *	2.414
Illinois	-0.036	-0.551	0.456 *	3.608
Indiana	-0.068	-1.077	0.319 *	2.266
Iowa	-0.162 *	-1.920	0.682 *	3.956
Kansas	-0.203 *	-2.789	0.265	1.099
Kentucky	-0.469 *	-4.845	0.154	1.127
Louisiana	-0.160 *	-2.891	0.219	1.233
Maine	-0.203 *	-2.618	-0.108	-0.513
Maryland	0.169	1.361	0.215 *	1.767
Massachusetts	-0.216 *	-4.293	0.301 *	2.935
Michigan	-0.148	-1.405	0.220 *	1.707
Minnesota	-0.126 *	-1.773	0.253 *	2.487
Mississippi	-0.321 *	-2.964	0.098	0.398
Missouri	-0.557 *	-3.155	0.350 *	2.291
Montana	-0.272 *	-2.324	0.210 *	1.676
Nebraska	-0.067	-0.576	0.699 *	3.452
Nevada	-0.443 *	-2.977	0.252 *	2.732
New Hampshire	-0.176	-1.097	0.073	0.419
New Jersey	-0.217 *	-4.276	0.265 *	2.393
New Mexico	0.052	0.345	-0.610 *	-1.858
New York	-0.249 *	-2.451	-0.058	-0.620
North Carolina	-0.263 *	-3.201	0.524 *	3.994
North Dakota	-0.044	-0.382	0.517 *	4.447
Ohio	-0.103	-1.503	0.488 *	4.593
Oklahoma	-0.185	-1.293	0.242 *	1.772
Oregon	0.003	0.023	0.072	0.568
Pennsylvania	-0.044	-0.647	-0.152	-1.022
Rhode Island	-0.120	-0.978	0.188	0.708
South Carolina	-0.002	-0.024	0.557 *	3.309
South Dakota	0.041	0.264	-0.153	-1.326
Tennessee	0.004	0.054	0.547 *	4.636
Texas	-0.236 *	-4.065	0.440 *	6.492
Utah	-0.116	-0.598	-0.212	-0.867
Vermont	-0.010	-0.061	-0.050	-0.186
Virginia	-0.413 *	-4.585	-0.041	-0.333
Washington	-0.633 *	-3.053	-0.235	-0.557
West Virginia	-0.317 *	-2.303	0.240 *	3.041
Wisconsin	-0.173 *	-3.687	0.451 *	3.034
Wyoming	0.101	0.544	0.360	1.126
US Total	-0.244		0.287	

* indicates statistical significance at the 10% level using White-corrected standard errors.

Table 1c. Estimated effects of NAFTA on state exports

	Mexico		Canada		Europe		Asia		Latin America		World
State	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Total
Alabama	0.439 *	1.680	0.351 *	5.462	-0.015	-0.216	-0.246 *	-3.804	0.147 *	1.681	0.121
Alaska	0.551	1.488	0.354 *	1.705	0.105	0.788	-0.009	-0.078	-0.220 *	-2.476	0.036
Arizona	0.209 *	2.042	0.232 *	2.442	0.088	0.720	0.348 *	4.198	-0.240 *	-2.693	0.225
Arkansas	0.338 *	1.874	0.356 *	4.251	-0.193 *	-1.673	0.098	1.120	0.052	0.576	0.179
California	0.202 *	3.357	0.245 *	4.355	-0.028	-0.475	0.330 *	4.512	0.046	0.628	0.212
Colorado	0.123	0.899	0.172	1.635	0.066	0.897	0.590 *	7.231	0.032	0.512	0.285
Connecticut	0.115	1.556	0.145	1.515	0.083	0.903	-0.106	-1.639	-0.145	-1.488	0.042
Delaware	0.406 *	2.677	-0.603 *	-4.374	0.134	0.623	0.091	1.460	0.166 *	2.011	-0.125
Dist. of Columbia	-0.029	-0.119	0.422	1.062	-0.407 *	-1.715	-0.091	-0.634	-0.188 *	-2.705	-0.150
Florida	-0.102 *	-1.746	-0.062	-1.051	-0.089 *	-1.921	0.032	0.339	-0.042	-0.852	-0.044
Georgia	0.159	1.474	0.262 *	1.989	0.024	0.234	0.300 *	4.266	0.034	0.460	0.163
Hawaii	-0.229	-0.399	-0.308 *	-3.558	0.013	0.177	-0.069	-0.532	-0.312 *	-10.701	-0.082
Idaho	-0.213	-1.631	0.094	1.464	-0.143	-1.192	0.418 *	3.497	-0.372 *	-6.118	0.152
Illinois	0.070	0.640	0.225 *	3.420	-0.118 *	-1.686	0.373 *	5.288	0.187 *	3.211	0.165
Indiana	0.036	0.343	0.428 *	6.021	0.093	1.566	0.079	1.125	0.003	0.044	0.259
Iowa	0.272 *	2.974	0.241 *	3.663	0.057	0.662	0.180 *	2.944	0.066	0.913	0.167
Kansas	0.033	0.281	0.420 *	3.934	-0.056	-0.792	0.273 *	3.312	0.014	0.134	0.219
Kentucky	0.080	0.831	0.620 *	6.444	0.108	1.152	0.146 *	2.496	0.437 *	3.855	0.354
Louisiana	-0.113	-0.769	0.097	1.052	-0.132 *	-2.303	0.240 *	3.032	0.044	0.694	0.063
Maine	-0.100	-0.920	0.103 *	2.428	-0.026	-0.343	-0.025	-0.330	-0.179 *	-2.796	0.018
Maryland	0.031	0.260	-0.003	-0.029	-0.309 *	-2.582	0.495 *	6.572	0.033	0.415	0.003
Massachusetts	0.137 *	1.712	0.239 *	2.404	-0.049	-1.030	-0.084 *	-1.683	-0.149 *	-2.689	0.012
Michigan	0.326	1.217	-0.161 *	-2.377	-0.135	-1.411	0.143 *	2.718	-0.010	-0.171	-0.036
Minnesota	-0.219 *	-4.308	0.214 *	3.391	-0.064	-1.050	0.169 *	2.339	-0.253 *	-4.130	0.084
Mississippi	0.073	0.461	-0.044	-0.891	-0.111	-1.019	-0.216 *	-2.361	-0.321 *	-2.625	-0.137
Missouri	0.043	0.514	0.181	0.950	0.346 *	1.992	0.020	0.329	-0.031	-0.520	0.165
Montana	0.541 *	1.778	-0.057	-0.839	0.181	1.560	-0.238 *	-2.409	-0.369 *	-10.941	0.000
Nebraska	0.644 *	3.825	0.276 *	3.403	-0.107	-1.059	0.194 *	2.699	-0.077	-1.129	0.215
Nevada	-0.794 *	-3.560	0.382 *	1.960	0.317 *	1.951	-0.033	-0.444	-0.198 *	-2.872	0.242
New Hampshire	0.334 *	4.030	0.141	1.591	-0.147	-0.902	-0.107	-1.369	-0.353 *	-4.536	-0.022

New Jersey	-0.011	-0.136	0.206 *	1.975	-0.091 *	-2.019	-0.004	-0.072	-0.081	-1.378	0.020
New Mexico	0.628 *	3.526	-0.095 *	-1.874	-0.139	-0.851	0.439 *	2.321	-0.265 *	-3.182	0.372
New York	-0.193 *	-1.800	0.262 *	2.895	-0.190 *	-1.989	-0.093	-1.296	-0.304 *	-4.488	-0.029
North Carolina	0.776 *	6.344	0.428 *	5.090	0.072	0.901	-0.083	-1.563	0.200 *	2.950	0.214
North Dakota	0.181	0.385	0.102	1.181	0.057	0.585	-0.201 *	-3.975	-0.269 *	-4.834	0.073
Ohio	0.050	0.741	0.200 *	3.401	-0.117	-1.609	0.089 *	2.013	0.055	0.917	0.106
Oklahoma	0.292 *	1.974	-0.071	-0.999	-0.127	-0.985	0.154 *	1.856	0.144	1.603	0.020
Oregon	0.245	1.347	0.057	1.467	0.090	0.772	0.347 *	3.636	-0.008	-0.103	0.231
Pennsylvania	0.016	0.265	0.266 *	3.176	-0.015	-0.254	0.060	0.962	0.058	0.952	0.120
Rhode Island	-0.090	-0.674	0.184	1.637	-0.122	-0.996	-0.071	-1.150	-0.207 *	-2.824	-0.009
South Carolina	0.964 *	5.481	0.427 *	5.144	-0.005	-0.056	0.042	0.486	0.051	0.868	0.211
South Dakota	0.057	0.210	0.428 *	2.664	0.029	0.197	-0.028	-0.271	-0.273 *	-7.199	0.179
Tennessee	0.382 *	3.903	0.407 *	4.028	-0.021	-0.286	0.146 *	2.568	0.154 *	2.541	0.227
Texas	0.138 *	4.658	0.379 *	6.636	0.002	0.033	0.121 *	1.655	-0.050	-1.132	0.130
Utah	0.262	1.430	-0.064	-0.636	0.322 *	1.653	-0.270 *	-2.193	0.024	0.293	0.055
Vermont	0.198	1.161	0.080	0.704	0.271 *	1.891	0.459 *	3.146	-0.243 *	-6.240	0.188
Virginia	0.468 *	3.756	0.208 *	4.262	0.105	1.124	-0.022	-0.326	0.129	1.395	0.109
Washington	-0.099	-0.352	-0.145	-1.229	-0.246	-1.233	0.080	0.560	-0.132	-1.005	-0.048
West Virginia	-0.442 *	-4.862	0.109	1.135	-0.079	-0.596	0.108 *	1.796	-0.439 *	-7.126	-0.014
Wisconsin	0.387 *	3.694	0.233 *	3.679	0.101 *	2.182	0.160 *	2.774	-0.079	-1.121	0.169
Wyoming	0.528	1.437	0.118	0.749	-0.472 *	-3.075	-0.222 *	-2.993	0.070	0.740	-0.040
US Total	0.157		0.152		-0.056		0.152		-0.027		0.078

* indicates statistical significance at the 10% level using White-corrected standard errors.

Table 2. Effects of NAFTA on regional exports[a]

	Mexico	Canada	Europe	Asia	Latin America	World
New England	0.118	0.160	-0.014	-0.050	-0.164	0.036
Mideast	-0.060	0.155	-0.155	-0.016	-0.152	0.008
Great Lakes	0.224	0.057	-0.069	0.193	0.060	0.090
Plains	0.065	0.232	0.021	0.162	-0.083	0.145
Southeast	0.315	0.253	0.023	0.039	-0.008	0.091
South Central	0.186	0.386	-0.058	0.101	0.068	0.144
Southwest	0.144	0.307	0.018	0.190	-0.053	0.144
Rocky Mountain	0.155	0.053	0.108	0.113	-0.008	0.155
Far West	0.187	0.135	-0.085	0.247	-0.012	0.142

[a] We use the BEA's regional classification, with their Southeast region split into the Southeast and the South Central regions. New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; Mideast: Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania; Great Lakes: Illinois, Indiana, Michigan, Ohio, and Wisconsin; Plains: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota; Southeast: Florida, Georgia, North Carolina, South Carolina, Virginia, and West Virginia; South Central: Alabama, Arkansas, Kentucky, Louisiana, Mississippi, and Tennessee; Southwest: Arizona, New Mexico, Oklahoma, and Texas; Rocky Mountain: Colorado, Idaho, Montana, Utah, and Wyoming; Far West: Alaska, California, Hawaii, Nevada, Oregon, and Washington.

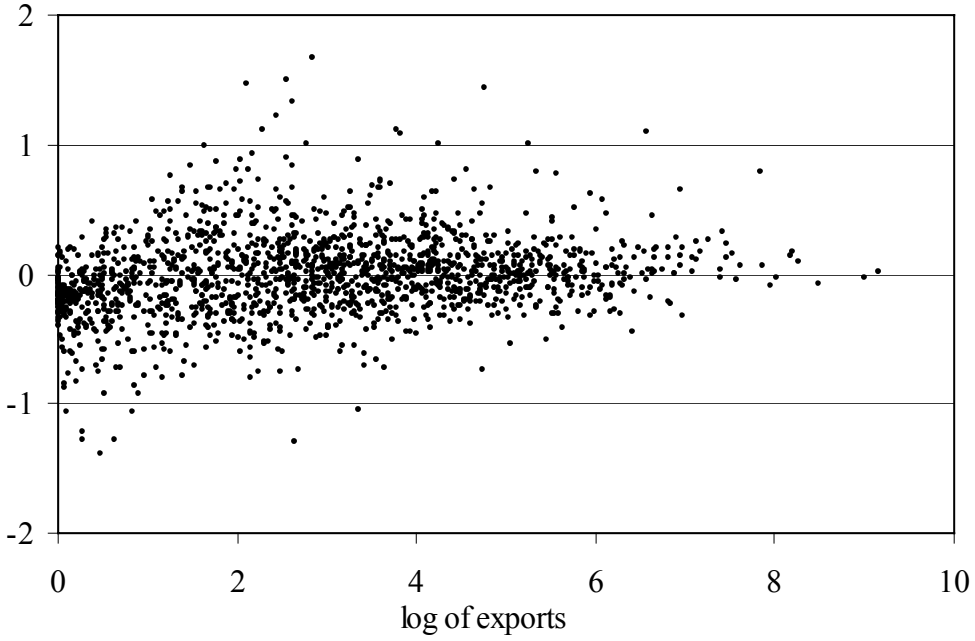

Figure 1. Plot of Residuals 1993

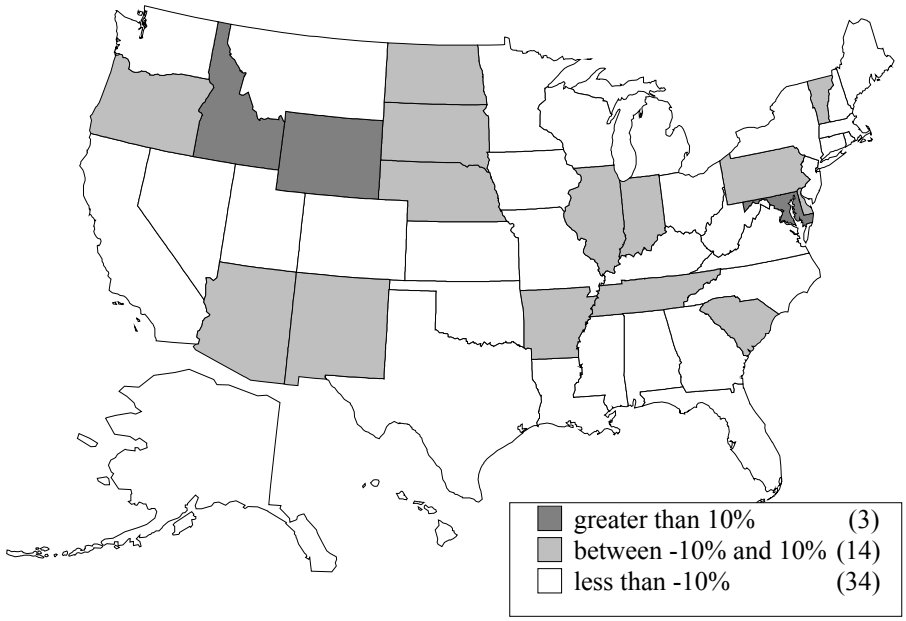

Figure 2. The effects of the EU on states' exports to the EU

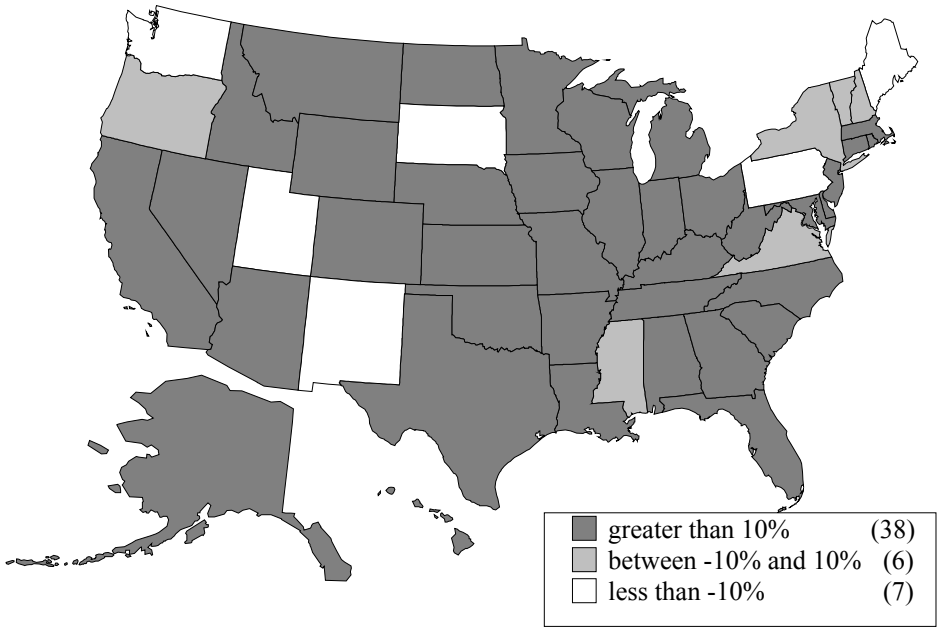

Figure 3. The effects of Mercosur on states' exports to Mercosur

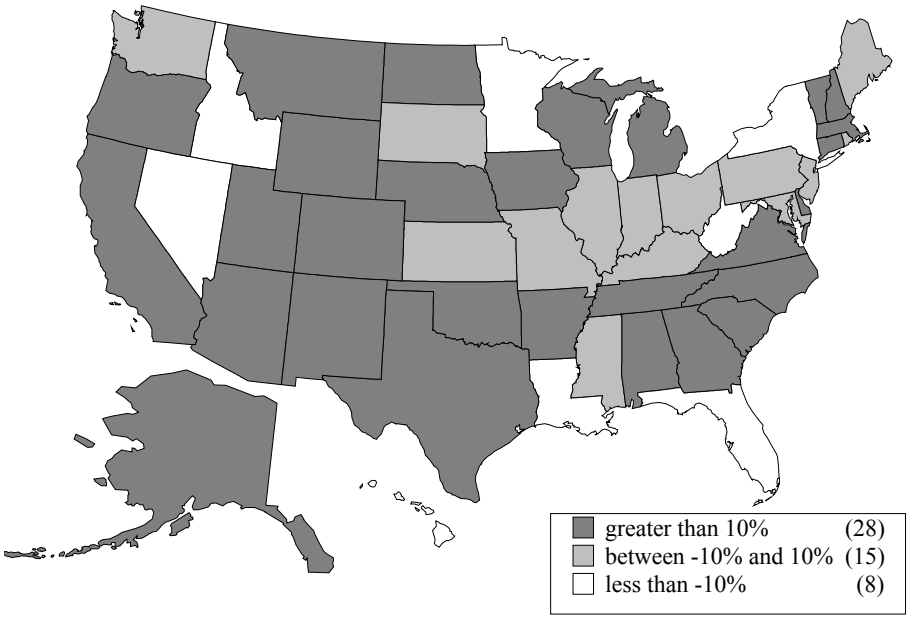

Figure 4. The effects of NAFTA on states' exports to Mexico

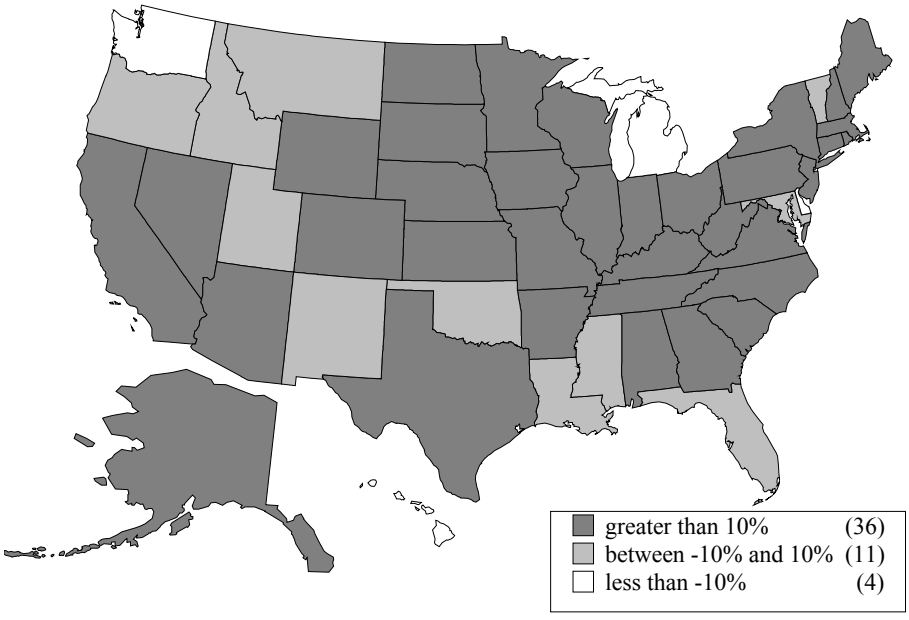

Figure 5. The effects of NAFTA on states' exports to Canada

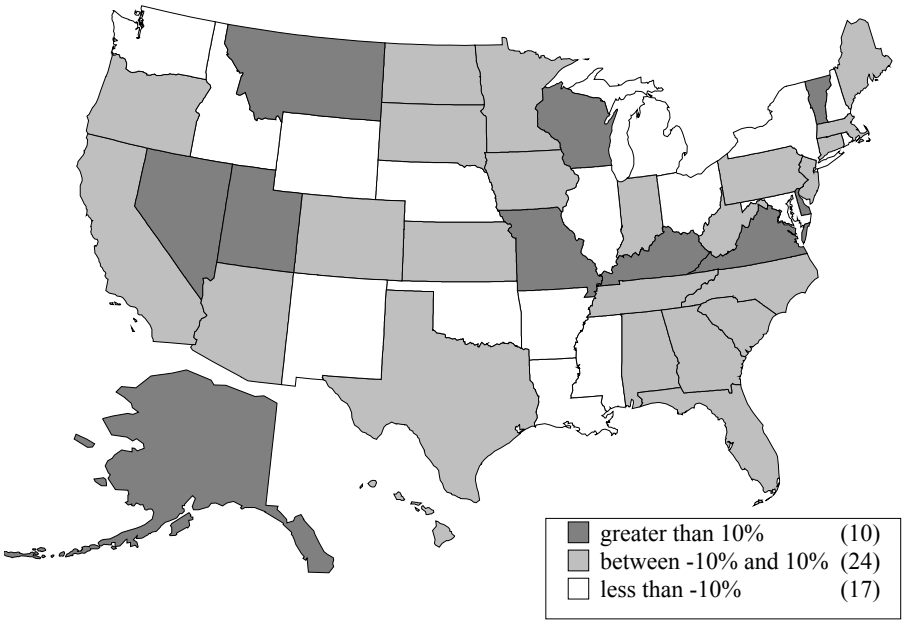

Figure 6. The effects of NAFTA on states' exports to Europe

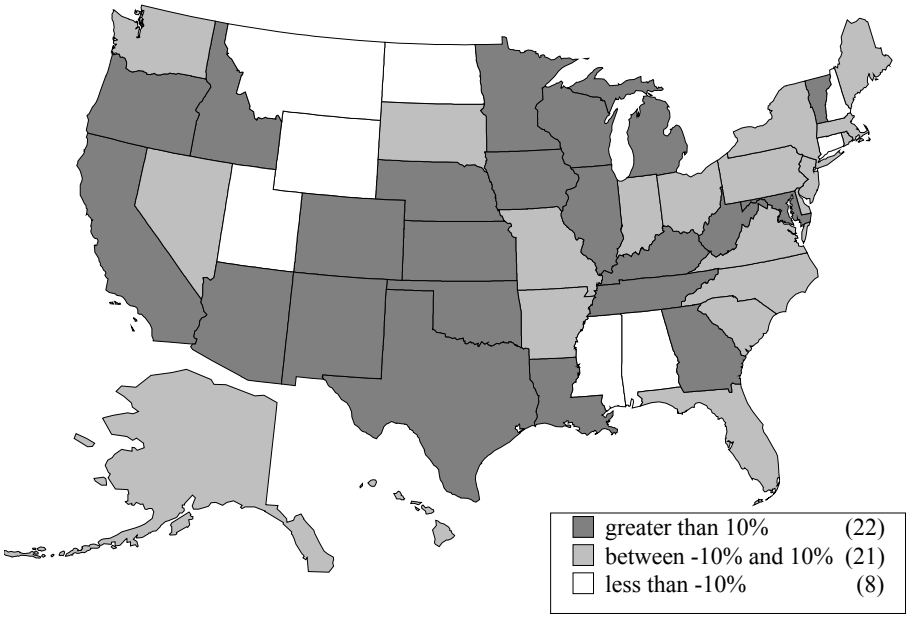

Figure 7. The effects of NAFTA on states' exports to Asia

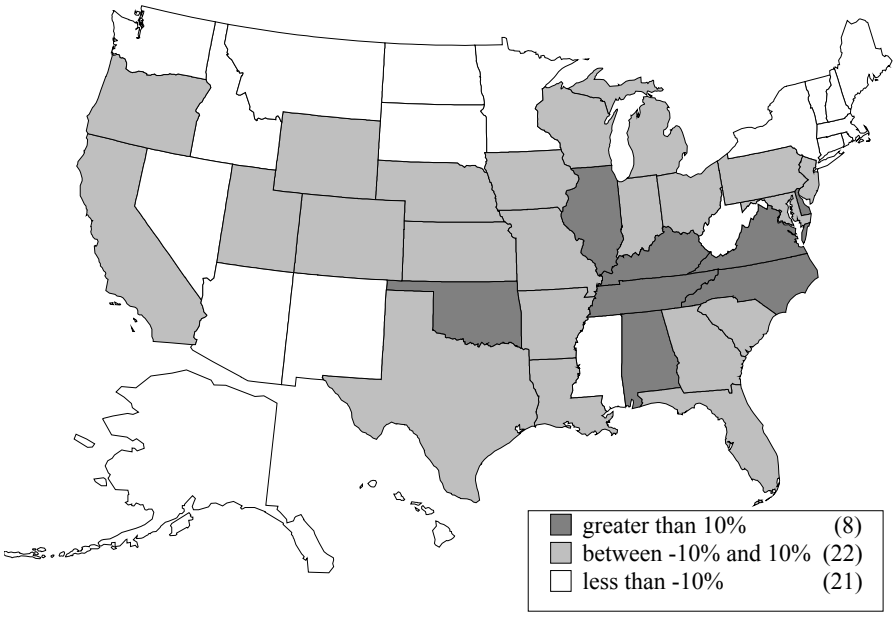

Figure 8. The effects of NAFTA on states' exports to Latin America and the Caribbean

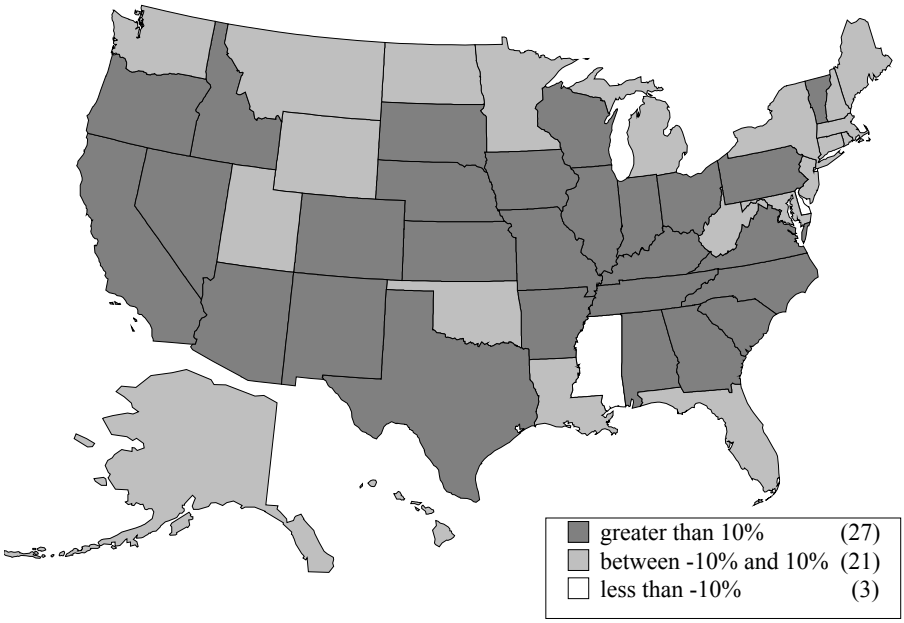

Figure 9. The effects of NAFTA on states' exports to the world